2-21-06 AF/ IFW

PATENT APPLICATION

"Express Mail" Mailing Label No.: EV 781 731 982 US

IN THE U.S. PATENT AND TRADEMARK OFFICE

February 17, 2006

Applicant(s): Hilmar R. MUELLER, et al.

For: MONITORING DEVICE FOR MELTING FURNACES

Serial No.: 10/642 388 Group: 1742

Confirmation No.: 9481

Filed: August 15, 2003 Examiner: Kastler

International Application No.: -

International Filing Date: -

Atty. Docket No.: WW C-60

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

LETTER TRANSMITTING APPEAL BRIEF FEE

Sir:

Enclosed is Appellants' check in the sum of $500.00, representing payment of the Appeal Brief fee. The Commissioner is hereby authorized to charge any additional fee which may be required by this paper, or to credit any overpayment to Deposit Account No. 06-1382. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

Brian Tumm

Brian R. Tumm

IN DUPLICATE

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Encl: Check ($500.00)

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APPELLANTS' BRIEF ON APPEAL UNDER 37 CFR §41.37

Sir:

This is an appeal under 37 CFR §41.37 to the Board of Patent Appeals and interferences of the United States Patent and Trademark Office from the final rejection of claims in the above-identified application.

One copy of Appellants' Brief is filed herewith, together with the requisite fee.

(i) REAL PARTY IN INTEREST

The real party in interest for this application is Wieland-Werke AG having a place of business in the Federal Republic of Germany, by virtue of an Assignment from the inventors as recorded at the PTO on February 12, 2004 at Reel 014970/Frame 0299.

(ii) RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision pending appeal.

(iii) STATUS OF CLAIMS

The above-identified patent application as amended contains 19 claims, namely Claims 1-15 and 17-20 which have been finally rejected and are being appealed.

Claim 16 has been cancelled.

(iv) STATUS OF AMENDMENTS

The claims were finally rejected in an Office Action mailed September 21, 2005.

On November 28, 2005, Appellants filed a Response which cancelled Claim 16 and amended Claim 1 to include the features of cancelled Claim 16.

The Examiner issued an Advisory Office Action dated December 9, 2005 maintaining the final rejection of the claims, but indicating that the proposed amendment of November 28, 2005 would be entered upon filing of an appeal.

Accordingly, Appellants hereby respectfully request entry of the amendment from the November 28, 2005 Response and the claims in the attached Appendix (viii) incorporate the approved November 28, 2005 amendment.

(v) SUMMARY OF INVENTION

Appellants' invention, is directed to a monitoring device for melting furnaces. The page, paragraph and line numbers set forth below correspond to Appellants' application as filed, not the application as published.

Claim 1 recites a monitoring device 1 for melting furnaces to facilitate the monitoring of a break out of melt, comprising a closed circuit of several electrically conductive sections with at least a partially conducting surface and a measuring/display device 6, wherein a first conductor section 2 is series connected to an ohmic resistor R and a second conductor section 4 as disclosed at paragraph [0023], lines 1-5 of Appellants' specification and illustrated in Appellants' Figure 1. Claim 1 recites that the first conductor section is arranged directly adjacent, however, electrically isolatingly spaced from and with respect to the second conductor section as set forth at paragraph [0023], lines 6-9. Finally, Claim 1 recites that the ohmic resistor R is not subjected to the furnace temperature as set forth at paragraph [0023], lines 13-15 of Appellants' specification.

Claim 2 recites that the conductor sections are interleaved in a comb-like construction or a loop meanderingly around one another as disclosed at paragraph [0011], lines 5-9 of Appellants' specification.

Claim 3 recites that the ohmic resistor R is larger by a factor of 100 to 1000 than a resistance value of the series connected conductor sections as disclosed at paragraph [0012], lines 2-4 of Appellants' specification.

Claim 4 recites an ohmic resistance value R = 0.5 to 50 kohm and Claim 5 recites the ohmic resistance value R = 1 to 5 kohm as disclosed at paragraph [0012], lines 13-15.

Claim 6 recites that the measuring/displaying device indicates during undisturbed normal operation essentially the magnitude of the ohmic resistor R as set forth at paragraph [0013], lines 5-8. Claim 6 further recites that during

breakdown due to a conductor break, the resistance value is infinite and during run out of melt the resistance valve of zero corresponds to a short circuit as disclosed at paragraph [0013], lines 16-18 and lines 22-26.

Claim 7 recites that the resistance value indications of infinite or of zero are each coupled with an acoustic or optic display as set forth at paragraph [0013], lines 31-33.

Claim 8 recites that the resistance value indication of zero is coupled with a device for turning off the furnace as set forth at paragraph [0013], lines 25-27.

Claim 9 recites that the conductor sections are arranged around a crucible filled with melt as disclosed at paragraph [0024], lines 4-6.

Claim 10 recites that the conductor sections are arranged holohedrally on the circumference of the crucible filled with melt as set forth at paragraph [0014], lines 4-6.

Claim 11 recites that the conductor sections are arranged on a surface of a refractory liner which faces away from the crucible filled with melt as set forth at paragraph [0014], lines 4-6.

Claim 12 recites that the refractory liner comprises a ceramic material as disclosed at paragraph [0015], lines 7-11.

Claim 13 recites that the crucible filled with melt forms a part of one of the conductor sections as disclosed at paragraph [0015], lines 12-13.

Claim 14 recites that the monitoring device comprises one of several monitoring devices arranged around the crucible filled with melt to form a monitoring network as disclosed at paragraph [0016], lines 3-8.

Claim 15 recites the melting furnace including a refractory liner surrounding the crucible as disclosed at paragraph [0024], lines 3-4 and that the ohmic resistor R has a resistance value that is clearly smaller than the resistance value of the refractory liner as disclosed at paragraph [0024], lines 13-15.

Claim 17 recites that the ohmic resistor ensures that the first and second conductor sections are otherwise electrically isolated from each other as disclosed at paragraph [0023], lines 1-9.

Independent Claim 18 recites a monitoring device including a measuring/displaying device; a first conductor section connected thereto; a second conductor section electrically isolated from the first conductor section; and an ohmic resistor connecting the first conductor section and the second conductor section to form a closed series circuit, the conductor sections being electrically isolated from each other, as discussed above and as set forth at paragraph [0023], lines 1-9.

Claim 18 further recites that the device monitors the resistance of the series circuit to detect a short circuit between the first and second conductor section resulting from a breakout of melt therebetween as set forth at paragraph [0023], lines 11-13.

Claim 19 recites that the ohmic resistor R is not directly subjected to the furnace temperature as set forth at paragraph [0023], lines 13-15.

Claim 20 recites a furnace including the monitoring device of Claim 18 comprising a crucible having the monitoring device arranged thereabout and a refractory liner surrounding the crucible wherein the first conductor section is mounted on the refractory liner as disclosed at paragraph [0024], lines 3-6. Claim 20 further recites that the ohmic resistor has a resistance value that is clearly smaller than the resistance value of the refractory liner as set forth at paragraph [0024], lines 13-15.

(vi) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

In the final rejection dated September 21, 2005, Claims 1-20 were rejected as being unpatentable over Hopf, U.S. Patent No. 5 319 671 (the Hopf patent) in view of the Giesserei 89 article to Hopf (the Hopf article). In the Amendment After Final Rejection, which has been entered, Claim 1 was amended to include the features of cancelled dependent Claim 16.

In view of the above, the rejection represented for review is the rejection of Claims 1-15 and 17-20 under 35 USC §103 as being obvious over the Hopf patent in view of the Hopf article (Hopf references).

Claims 1, 6, 18 and 19 are each separately patentable.

Dependent Claims 2-5, 7-15 and 17 stand or fall with Appellants' Claim 1. Claim 20 stands or falls with Appellants' Claim 18.

(vii) APPLIED PRIOR ART

The Hopf patent and the Hopf article describe essentially the same monitoring device. The Hopf patent discloses a prewarning device for induction melting furnaces having an open circuit type arrangement. The prewarning is effected by determining the thickness of a furnace lining.

Column 4, lines 49-55 of the Hopf patent discloses an intermediate layer 3 between a ceramic coating composition 4 forming an inductor and a ceramic furnace lining 2. The intermediate layer 3 can comprise a mat 8 having ceramic foils 9, 10. The foils 9, 10 support groups of electrodes 12, 13 for the mat 8. The electrodes 12, 13 are part of electrode networks 7, 8 each separately connected to an evaluation unit 16. Figure 3 of the Hopf patent below shows the arrangement of the first group of electrodes 12 with respect to the second group of electrodes 13 for the mat 8.

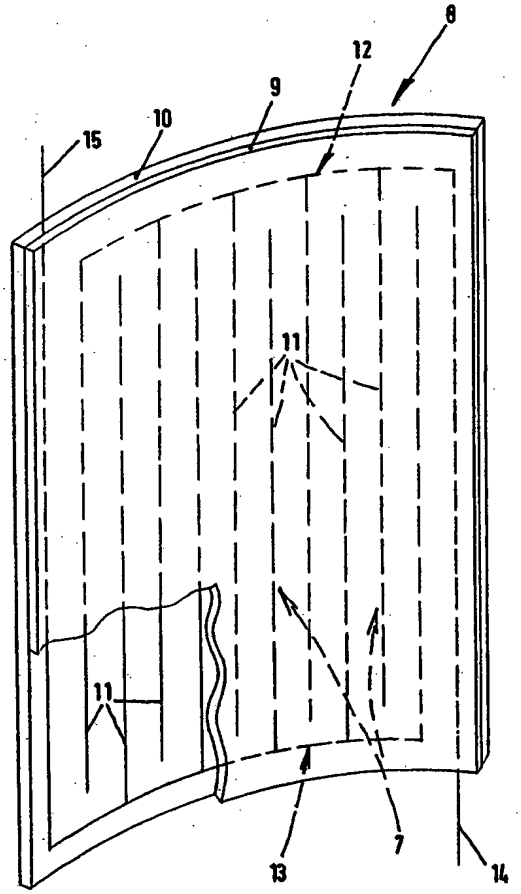

FIGURE 3 OF HOPF PATENT

Column 4, lines 7-12 of the Hopf patent discloses measuring the resistance of the ceramic foils 9, 10 via a small current that passes between the groups of electrodes 12, 13. The resistance value between the electrode networks 7, 8 of the Hopf patent is dependent upon the temperature of the foils 9, 10 which depends on the temperature of the ceramic furnace lining 2. A decrease in the thickness of the furnace lining 2 results in an increase in the temperature at the outer surface thereof adjacent the foils and thus the temperature of the foils 9, 10. The increase in the temperature of the foils decreases the resistance thereof.

Bild 3 at page 37 of the Hopf article discloses the circuit having a resistance of Rel = 74,000 KΩ for a furnace lining thickness of 100%, a resistance Rel = 535 KΩ for a thickness of 50%, and a resistance Rel = 2 KΩ for a remaining thickness of 15% for the furnace lining.

In the Hopf references, it is difficult to differentiate a high resistance value for a furnace lining of 100% thickness from cable breakage or connection loss. The resistance value of 74,000 KΩ for a furnace lining of 100% thickness is so large that an open circuit failure, which of course prevents the monitoring system from functioning properly, may not be detected.

The Office Action appears to rely on page 2, paragraph [0005] of Appellants' specification, which references the Hopf article, for the use of an ohmic resistor between a pair of electrodes. Paragraph [0005], lines 4-9 and lines 12-14 of Appellants' specification discloses the prior art Hopf system indirectly measuring furnace wall thickness by measuring the temperature of a refractory material, such as a ceramic, which corresponds to the foils containing the electrodes. As temperature of the material increases, resistance is reduced. There is no mention of an ohmic resistor for the Hopf system in Appellants' specification. The comments in Appellants'

specification do not differ from the disclosure of the Hopf references.

CLAIM 1

Appellants' invention provides an ohmic resistor R for the monitoring device, which is separate from and not affected by the temperature of a furnace wall. Appellants' Claim 1 now recites that the "ohmic resistor R is not subjected to the furnace temperature". The claimed arrangement clearly differs from the temperature sensing foils of the Hopf references, which are subject to and directly sense the temperature of the furnace lining, which is the main structure of the furnace.

Further, if the foils 9, 10 of the Hopf references are not subjected to the furnace temperature, the monitoring device does not provide a monitoring function. If the Hopf references are modified to avoid the sensing of or effect of temperature on the foils 9, 10, the Hopf monitoring device would be inoperative.

Appellants' Claim 1 also recites that the monitoring device includes "a closed circuit of several electrically conductive sections", "a first conductor section is series connected to an ohmic resistor R and a second conductor section" and "the first conductor section is arranged directly adjacent, however, electrically isolatingly spaced from and with respect to the second conductor section".

This arrangement is not present in the applied prior art. The Hopf references, as discussed above, utilize the ceramic foils containing electrodes with the furnace lining of the melting furnace to measure a temperature dependent variable resistance. The ceramic foils 9, 10 with electrodes are not isolatingly spaced from each other.

For the above reasons Claim 1 distinguishes the applied prior art.

CLAIM 6

Appellants' dependent Claim 6 recites that the measuring/displaying device indicates "breakdown due to a conductor break". As best understood, the Hopf references

provide a measurement of the temperature affected resistance of the lining wall. Such resistance for a thick wall lining is very high (74,000 KΩ in the Hopf article) and thus the system disclosed in the Hopf references likely would not be able to detect a conductor break. The importance of this feature is discussed in paragraph [0013] of Appellants' specification. Therefore Claim 6 further distinguishes the Hopf references.

CLAIM 18

Independent Claim 18 recites a monitoring device including "an ohmic resistor connecting the first conductor section and the second conductor section to form a closed series circuit, which ensures that the first and second adjacent conductor sections are electrically isolated from each other except for the current path of the ohmic resistor".

The Hopf references provide a small current flow between the conductor sections through the entirety of the ceramic foils. The resistance value thereof depends on the temperature of the furnace lining. Thus the Hopf references do not include an ohmic resistor providing a current path while the conductor sections are otherwise electrically isolated.

For the above reasons, Claim 18 distinguishes the Hopf references.

CLAIM 19

Claim 19 recites that "the ohmic resistor is not directly subjected to the furnace temperature".

Paragraph [0010], lines 3-7 of Appellants' specification discloses that temperature neither damages the resistor nor substantially changes the electric resistance. Thus the phrase not directly subjected to "high temperature" in paragraph [0010] of the specification clearly means subjected to a temperature that changes the value of the ohmic resistor R. Therefore Claim 19 further distinguishes the "prewarning" device disclosed in the Hopf references which must measure

changes in temperature to determine the thickness of the lining as discussed above.

For the reasons advanced above, it is respectfully submitted that the rejection of Claims 1-15 and 17-20 under 35 USC §103 is clearly in error and should be reversed.

Favorable consideration is respectfully solicited.

Respectfully submitted,

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Brian R. Tumm

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Sidney B. Williams, Jr.	Reg. No. 24 949

Encl: Appendices
Postal Card

(viii) CLAIMS APPENDIX - LISTING OF CLAIMS

1. (Previously presented) A monitoring device for melting furnaces to facilitate the monitoring of a break out of melt, comprising a closed circuit of several electrically conductive sections with at least a partially conducting surface and a measuring/displaying device, wherein a first conductor section is series connected to an ohmic resistor R and a second conductor section, wherein the first conductor section is arranged directly adjacent, however, electrically isolatingly spaced from and with respect to the second conductor section, and wherein the ohmic resistor R is not subjected to the furnace temperature.

2. (Original) The monitoring device for melting furnaces according to Claim 1, wherein the conductor sections are interleaved in a comb-like construction or are looped meanderingly around one another.

3. (Previously presented) The monitoring device for melting furnaces according to Claim 1, wherein the ohmic resistor R is larger by a factor of 100 to 1000 than a resistance value of the series connected conductor sections.

4. (Original) The monitoring device for melting furnaces according to Claim 1, wherein the ohmic resistance value R = 0.5 to 50 kohm.

5. (Original) The monitoring device for melting furnaces according to Claim 1, wherein the ohmic resistance value R = 1 to 5 kohm.

6. (Previously presented) The monitoring device for melting furnaces according to Claim 1, wherein the measuring/displaying device indicates during undisturbed normal operation essentially the magnitude of the ohmic

resistor R, during breakdown due to a conductor break the resistance value of infinite, and during run out of melt the resistance value of zero corresponding to a short circuit.

7. (Previously presented) The monitoring device for melting furnaces according to Claim 6, wherein the resistance value indications of infinite or of zero are each coupled with an acoustic or optic display.

8. (Previously presented) The monitoring device for melting furnaces according to Claim 6, wherein the resistance value indication of zero is coupled with a device for turning off of the furnace.

9. (Previously presented) A melting furnace with a monitoring device according to Claim 1, wherein the conductor sections are arranged around a crucible filled with melt.

10. (Previously Presented) The melting furnace with a monitoring device according to Claim 9, wherein the conductor sections are arranged holohedrally on the circumference of the crucible filled with melt.

11. (Previously presented) The melting furnace with a monitoring device according to Claim 9, wherein the conductor sections are arranged on a surface of a refractory liner which faces away from the crucible filled with melt.

12. (Previously presented) The melting furnace with a monitoring device according to Claim 11, wherein the refractory liner comprises a ceramic material.

13. (Previously presented) The melting furnace with a monitoring device according to Claim 9, wherein the crucible filled with melt forms a part of one of the conductor sections.

14. (Previously presented) The melting furnace according to Claim 9, wherein the monitoring device comprises one of several monitoring devices arranged around the crucible filled with melt to form a monitoring network.

15. (Previously presented) The melting furnace with a monitoring device according to Claim 9, including a refractory liner surrounding the crucible, wherein the ohmic resistor R has a resistance value that is clearly smaller than the resistance value of the refractory liner.

16. (Cancelled)

17. (Previously presented) The monitoring device for melting furnaces according to Claim 1, wherein the ohmic resistor ensures that the first and second conductor sections are otherwise electrically isolated from each other.

18. (Previously presented) A monitoring device for melting furnaces to monitor a break out of melt, comprising:

a measuring/displaying device;

a first conductor section electrically connected to the measuring/displaying device;

a second conductor section electrically isolated from the first conductor section and arranged adjacent to the first conductor section; and

an ohmic resistor connecting the first conductor section and the second conductor section to form a closed series circuit, which ensures that the first and second adjacent conductor sections are electrically isolated from each other except for the current path of the ohmic resistor,

wherein said device monitors the resistance of the series circuit to detect a short circuit between the first and second conductor sections resulting from a break out of melt therebetween.

19. (Previously presented) The monitoring device for melting furnaces according to Claim 18, wherein the ohmic resistor R is not directly subjected to the furnace temperature.

20. (Previously presented) A furnace including the monitoring device according to Claim 18, comprising:

a crucible, wherein the monitoring device is arranged about the crucible; and

a refractory liner surrounding the crucible, wherein the first conductor section is mounted on the refractory liner,

wherein the ohmic resistor has a resistance value that is clearly smaller than the resistance value of the refractory liner.

(ix) EVIDENCE APPENDIX

Not applicable.

(x) RELATED PROCEEDINGS APPENDIX

Not applicable.

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Commissioner for Patents
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EXPRESS MAILING CERTIFICATE

Sir:

I hereby certify that the attached paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

FLYNN, THIEL, BOUTELL & TANIS, P.C.

By: _____

Date: February 17, 2006

Document(s) attached: Letter Transmitting Appeal Brief Fee dated February 17, 2006 including enclosures listed thereon

Appellants' Brief on Appeal Under 37 CFR §41.37 dated February 17, 2006 including enclosures listed thereon

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191.05/05